

REPORT DOCUMENTATION PAGE**Form Approved**
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY)		2. REPORT TYPE Master of Military Studies Research Paper		3. DATES COVERED (From - To) September 2009 - April 2010	
4. TITLE AND SUBTITLE The Falklands War, 1982: How Technological Deployments Shaped Decisions and the Outcome of the War.				5a. CONTRACT NUMBER N/A	
				5b. GRANT NUMBER N/A	
				5c. PROGRAM ELEMENT NUMBER N/A	
6. AUTHOR(S) Liu, Andy, C				5d. PROJECT NUMBER N/A	
				5e. TASK NUMBER N/A	
				5f. WORK UNIT NUMBER N/A	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) USMC Command and Staff College Marine Corps University 2076 South Street Quantico, VA 22134-5068				8. PERFORMING ORGANIZATION REPORT NUMBER N/A	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Federal Bureau of Investigation 935 Pennsylvania Ave NW Washington, DC 20535				10. SPONSOR/MONITOR'S ACRONYM(S) FBI	
				11. SPONSORING/MONITORING AGENCY REPORT NUMBER N/A	
12. DISTRIBUTION AVAILABILITY STATEMENT Unlimited					
13. SUPPLEMENTARY NOTES Dr. Donald F. Bittner provided directions and structure to the research of this paper.					
14. ABSTRACT The primarily focus of this paper is on the analysis of the technological weapons as well as how their deployment shaped the commanders' decisions. Specifically, the British's employment of the AIM-9L Sidewinder air-to-air missiles, the Harrier, and nuclear powered submarines shaped the Argentinean forces; conversely, Argentina's deployment of the five air launched AM39 Exocet missiles and its large fleet of A4 Skyhawks, Mirage 5s, and eleven Mirage 3s ultimately failed to deter the British fleet from retaking the Falklands.					
15. SUBJECT TERMS Falklands War, Exocet, Sidewinder, Matra, Magic R550					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 34	19a. NAME OF RESPONSIBLE PERSON Marine Corps University / Command and Staff College
a. REPORT Unclass	b. ABSTRACT Unclass	c. THIS PAGE Unclass			19b. TELEPHONE NUMBER (Include area code) (703) 784-3330 (Admin Office)

1. REPORT DATE. Full publication date, including day, month, if available. Must cite at least the year and be Year 2000 compliant, e.g., 30-06-1998; xx-08-1998; xx-xx-1998.

2. REPORT TYPE. State the type of report, such as final, technical, interim, memorandum, master's thesis, progress, quarterly, research, special, group study, etc.

3. DATES COVERED. Indicate the time during which the work was performed and the report was written, e.g., Jun 1997 - Jun 1998; 1-10 Jun 1996; May - Nov 1998; Nov 1998.

4. TITLE. Enter title and subtitle with volume number and part number, if applicable. On classified documents, enter the title classification in parentheses.

5a. CONTRACT NUMBER. Enter all contract numbers as they appear in the report, e.g. F33615-86-C-5169.

5b. GRANT NUMBER. Enter all grant numbers as they appear in the report, e.g. 1F665702D1257.

5c. PROGRAM ELEMENT NUMBER. Enter all program element numbers as they appear in the report, e.g. AFOSR-82-1234.

5d. PROJECT NUMBER. Enter all project numbers as they appear in the report, e.g. 1F665702D1257; ILIR.

5e. TASK NUMBER. Enter all task numbers as they appear in the report, e.g. 05; RF0330201; T4112.

5f. WORK UNIT NUMBER. Enter all work unit numbers as they appear in the report, e.g. 001; AFAPL30480105.

6. AUTHOR(S). Enter name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. The form of entry is the last name, first name, middle initial, and additional qualifiers separated by commas, e.g. Smith, Richard, Jr.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES). Self-explanatory.

8. PERFORMING ORGANIZATION REPORT NUMBER. Enter all unique alphanumeric report numbers assigned by the performing organization, e.g. BRL-1234; AFWL-TR-85-4017-Vol-21-PT-2.

9. SPONSORING/MONITORS AGENCY NAME(S) AND ADDRESS(ES). Enter the name and address of the organization(s) financially responsible for and monitoring the work.

10. SPONSOR/MONITOR'S ACRONYM(S). Enter, if available, e.g. BRL, ARDEC, NADC.

11. SPONSOR/MONITOR'S REPORT NUMBER(S). Enter report number as assigned by the sponsoring/ monitoring agency, if available, e.g. BRL-TR-829; -215.

12. DISTRIBUTION/AVAILABILITY STATEMENT. Use agency-mandated availability statements to indicate the public availability or distribution limitations of the report. If additional limitations/restrictions or special markings are indicated, follow agency authorization procedures, e.g. RD/FRD, PROPIN, ITAR, etc. Include copyright information.

13. SUPPLEMENTARY NOTES. Enter information not included elsewhere such as: prepared in cooperation with; translation of; report supersedes; old edition number, etc.

14. ABSTRACT. A brief (approximately 200 words) factual summary of the most significant information.

15. SUBJECT TERMS. Key words or phrases identifying major concepts in the report.

16. SECURITY CLASSIFICATION. Enter security classification in accordance with security classification regulations, e.g. U, C, S, etc. If this form contains classified information, stamp classification level on the top and bottom of this page.

17. LIMITATION OF ABSTRACT. This block must be completed to assign a distribution limitation to the abstract. Enter UU (Unclassified Unlimited) or SAR (Same as Report). An entry in this block is necessary if the abstract is to be limited.

United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068

MASTER OF MILITARY STUDIES

TITLE:

THE FALKLANDS WAR, 1982: HOW TECHNOLOGICAL DEPLOYMENTS SHAPED
DECISIONS AND THE OUTCOME OF THE WAR

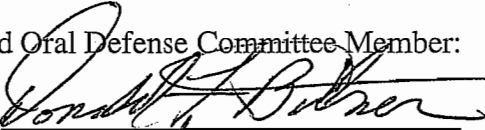
AUTHOR:

SA ANDY C. LIU, FBI

AY 09-10

Mentor and Oral Defense Committee Member:


Donald F. Bittner, Ph.D.
Professor of History

Approved: 

Date: 12 April 2010

Oral Defense Committee Member:

Heidi Agle
Commander, USN

Approved: 

Date: 12 APR, 2010


04/12/10

Rebecca Johnson, PhD

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENT AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

QUOTATION FROM, ABSTRACTION FROM, OR REPRODUCTION OF ALL OR ANY PART OF THIS DOCUMENT IS PERMITTED PROVIDED PROPER ACKNOWLEDGEMENT IS MADE.

Executive Summary

Title: The Falklands War, 1982: How Technological Deployments Shaped Decisions and the Outcome of the War.

Author: Special Agent Andy C. Liu, FBI

Thesis: Argentina's defeat in the Falklands War was steadily shaped by the Britain's Royal Navy's direct and indirect use of weapons and deployments of forces.

Discussion: The Falklands War of 1982 was fought between Argentina and the United Kingdom over the sovereignty of the Falkland Islands, also known as the Malvinas, an archipelago 400 nautical miles east from the southern region of Argentina. By studying and analyzing the technological weapons deployed on both sides of the conflict, a meaningful conclusion can be reached on how various technological weapons shaped commanders' decisions and the ensuing outcome of the war. This paper does not intend to cover operational tactics, operational strategy, diplomatic endeavors, logistical requirements, and leadership. The primarily focus is on the analysis of the technological weapons as well as how their deployment shaped the commanders' decisions. Specifically, the British's employment of the AIM-9L Sidewinder air-to-air missiles, the Harrier, and nuclear powered submarines shaped the Argentinean forces; conversely, Argentina's deployment of the five air launched AM39 Exocet missiles and its large fleet of A4 Skyhawks, Mirage 5s, and eleven Mirage 3s ultimately failed to deter the British fleet from retaking the Falklands.

Conclusion: Technological weapons allowed the British to successfully retake the Falkland Islands. Conversely, the lack in the quantity of technological weapons failed the Argentines in their bid to hold on to the Malvinas.

Table of Contents

	Page
TABLE OF CONTENTS	i
PREFACE	ii
INTRODUCTION	1
BACKGROUND	3
OPENING FOR WAR BY TAKING SOUTH GEORGIA	8
HARRIER VERSUS THE MIRAGE	9
BRITISH NUCLEAR SUBMARINES	11
FIVE AIR LAUNCHED AND ONE LAND BASED EXOCET	12
THE CONSTRAINED ARGENTINE FIGHTER JETS	17
CONCLUSION	20
APPENDIX A - The Atlantic Area of Operation	23
APPENDIX B - Map of the Falkland Islands with Major Event	24
APPENDIX C - Chronology of Events	25
APPENDIX D - Aircraft Specifications	26
BIBLIOGRAPHY	27
ENDNOTES	29

Preface

I became interested in the Falkland Islands War of 1982 because of its short duration, rapid development, and high intensity character of the conflict. The Falkland Islands War of 1982 is a modern warfare strategist's dream because it involved two industrialized nation fighting over a remotely occupied archipelago without the following influences to effect its operations: (1) lack of a revolutionary ideology, (2) insurrection of the local populace, (3) fighting done by a third nation, and (4) the geography and location of the Falkland Islands. Hence, both belligerents were considered relatively equally matched at the beginning of the war. If my readers want to understand whether deploying technological weapons can shape commanders' decision and the outcome of a war, the Falkland Islands War of 1982 would be an ideal example. This paper does not cover operational tactics, operational strategy, diplomatic endeavors, logistical requirements, and leadership.

The primarily focus is on the analysis of the technological weapons as well as how their deployment shaped the commanders' decisions. Specifically, the British's employment of the AIM-9L Sidewinder air-to-air missiles, the Harrier, and nuclear powered submarines shaped the Argentinean forces; conversely, Argentine's deployment of the five air launched AM39 Exocet missiles and its large fleet of A4 Skyhawks, Mirage 5s, and eleven Mirage 3s ultimately failed to deter the British fleet from retaking the Falklands. The backbone of my research is mainly books written on the Falkland Islands War of 1982, and notably authors such as Chris Chant, Duncan Anderson, and Martin Middlebrook.

Lastly, I want to thank Dr. Donald F. Bittner for his guidance, the FBI for the investment in my professional development, and my family for enduring my absence during Christmas, New Year, and many weekends which were required to research and write this paper.

Introduction

As the military forces around the world modernize and employ sophisticated weapons and platforms, expectations that technological weapon superiority can shape the outcome of a war are not uncommon. From the German panzers in World War II to the Cold War's arms race between the United States and the Soviet Union, today, the ambitious pursuance of highly sophisticated killing machines such as the F-22 raptor, EF2000 Typhoon, nuclear powered submarines, Predator and other unmanned aerial vehicles, as well as an array of cruise missiles are the continuation of these expectations. In consequence, the Falklands War of 1982 is a good case study of sophisticated weapons, platforms, and how their deployments can shape decisions and the outcome of the war. Due to the fact that neither the United Kingdom nor Argentina was a conventional superpower nation, this provides an opportunity for a sanitized analysis of the sophisticated weapons and platforms that empowered both the British and the Argentinean military forces in their bids for victory. Otherwise, a superpower nation in a conflict is likely to saturate a conflict with overwhelming technologies and make it impracticable to gauge how each piece of the technology shaped the enemy's decision and the outcome of the war. Specifically, British employment of the AIM-9L Sidewinder air-to-air missiles, the Harrier, and nuclear powered submarines shaped the Argentinean forces; conversely, Argentina's deployment of the five air-launched AM39 Exocet missiles and its large fleet of A4 Skyhawks, Mirage 5 Daggers, hereinafter "Dagger," and eleven Mirage 3s ultimately failed to deter the British from retaking the Falklands.

For the British, the FRS.1 Sea Harrier and GR.3 Harrier, or commonly referred to as the "Harrier" or simply "the jump jet," was the untested platform coming into the Falklands War. The Harriers were superior in terms of speed, maneuverability, and versatility against the

outdated A4 Skyhawks; however, when going up against the more modern and faster Mirage 3s and 5s, the pilots relied more on training and knowledge of strengths and weaknesses of the opponents' aircraft to achieve air superiority.¹ With only thirty-eight aircraft available, the British gambled on this untested fighter jet to provide local air superiority from Argentina's fleet of 180 fighter and bomber aircrafts. The Harrier's vector thrust technology enabled the Royal Navy (RN) to deploy them from their only two small aircraft carriers, the *Hermes* and the *Invincible*, without the need to have a catapult system for takeoff. This became a challenge for the Harrier as they faced a numerically superior foe with ratio of five-to-one in air operations over the Falklands.

Nonetheless, confidence in the Harrier would be bolstered by the American made AIM-9L Sidewinder air-to-air missile – the first “all aspect” Sidewinder with the ability to attack from all directions.² Proven to be the most important weapon employed in the early phase of the war, the Sidewinder leveled the disproportionate aircraft ratio with its immense superiority over the French made Matra air-to-air missile³ deployed by the Argentinean Air Force, also known as the Fuerza Aérea Argentina (FAA).⁴ The marriage of the Harrier and the Sidewinder would shaped the air war and how the FAA deployed their fighter jets.

Likewise, the British nuclear powered attack submarine was in every way superior to Argentina's four conventional diesel powered submarines. Able to stay submerged for longer periods of time, stay hidden, and track enemy surface fleet movements, nuclear powered submarines gave the British the initiative and the advantage in operating in Argentinean waters. With the combination of superior missiles and planes that dominated the skies, and nuclear-powered submarines that controlled the seas, these sophisticated weapons systems enabled the British to achieve their strategic, operational, and tactical objectives.

In response to the RN's fleet, the Argentines readied their newly acquired Exocet missiles. Built by the French, the AM39 Exocet was a formidable anti-ship missile⁵ capable of destroying enemy ships at a range of 45-miles.⁶ The plan was to use the Exocet missiles against the RN ships, specifically, the aircraft carriers to quickly stop or defeat any British's attempt to retake the Falkland Islands. As soon as it became clear that the United Kingdom was responding militarily to the Argentine seizure of the Falklands, France refused the delivery of an ordered nine remaining Super Etendard fighter-bombers and an equal number of Exocet missiles – capping the Argentine inventory of each at five.⁷ When the initial aerial engagements with the Harrier proved futile, the FAA quickly abandoned aerial combat and constrained their fighter jets for bombing and strafing British ships only. Convinced that the British task force's center of gravity was their surface fleet, the FAA pilots disregarded the Harriers and fought through the RN's Sea Wolf and Sea Dart anti-air missile systems in order to reach their targets; thus, the Harriers and anti-air systems took on the Argentinean jets throughout the war with varying degrees of success. Bearing heavy losses in pilots and aircrafts despite valor and some tactical successes, the FAA was ultimately unable to compensate for the limited quantity of the Exocet missiles. As a result, Argentine's defeat in the Falklands War was steadily shaped by the RN's direct and indirect use of weapons and deployments of forces, and their own limited quantity of a threat to the British fleet.

Background

The Falklands War of 1982 was fought between Argentina and the United Kingdom from mid-March to mid-June over the sovereignty of the Falkland Islands, also known as the Malvinas, an archipelago 400 nautical miles east from the southern region of Argentina. (See Appendix A) After decades of fruitless negotiations by the Argentineans to peacefully reacquire

the Falkland Islands from the British, the Argentine junta (a three-man army, navy, and air force ruling body) resorted to military invasion as the solution to decades of failed diplomacy.⁸

Another factor effected this decision: an opportunity to redirect the mounting domestic political pressure and opposition from the Argentine people to return their government to democratic rule.

On 15 December 1981, Admiral Jorge Anaya, the Commander-in-Chief of the Argentinean navy command, also known as the *Comando de la Aviación Naval Argentina* (CANAN), and a member of the ruling junta, ordered Vice Admiral Juan José Lombardo to devise a military plan to retake the Falkland Islands if another round of negotiation should fail.⁹ The negotiations did go poorly.¹⁰ On 15 March 1982, Lombardo presented the first version of the military plan.¹¹ Plotted in secrecy, the two-part plan involved PROJECT ALPHA, a clandestine establishment of an Argentine presence on South Georgia Island, and Operation AZUL, later renamed ROSARIO, a full-scale invasion of the Falklands.¹² Operation AZUL was scheduled between mid-May to mid-July with the preferred date being 9 July 1982, Argentina's Independence Day. This would also occur during the southern winter.

The invasion of the Falklands depended upon two conditions: first, wait until *Endurance*, a RN ice patrol ship, departed the area; and second, initiate the invasion of the Falkland Islands in the middle of the southern winter when inhospitable conditions would render any possible large-scale naval movements and military operations problematical in the event that Britain chose to respond.¹³ For the junta, the plan to retake the Falkland Islands was a practical and realistic one. Argentina would enjoy the shorter line of communication, only 400 miles long from their mainland to the islands, versus 7,500 miles from the United Kingdom to them. (See Appendix A) Furthermore, "Admiral Anaya had fully expected that Britain would not mount a major naval and military expeditionary force which would be required to retake the Falklands

during southern winter, that the United States would remain neutral in the affair, and that the United Nations would pursue long negotiations, but in the end, be pleased to see the Falklands dispute settled in favor of Argentina.”¹⁴

To the detriment of Vice Admiral Lombardo’s plan, on 16 March 1982 an incident occurred on South Georgia Island which forced accelerating the junta’s plan three months ahead of schedule. The specific event involved raising of the Argentina flag on South Georgia by an Argentinean crew that were under contract to scrap metal from an abandoned whaling station.¹⁵ This was observed and reported by a member of the British Antarctic Team.¹⁶ In response, on 23 March 1982, the British Foreign Minister pointedly informed the Argentinean government to remove the workers. The Argentine junta instead defended them and began preparations to execute PROJECT ALPHA and Operation ROSARIO.¹⁷

After learning from radio intercepts that the Argentine fleet was preparing for an invasion,¹⁸ on 26 March 1982, at least one British nuclear submarine was ordered to the Falkland Islands in attempt to deter it.¹⁹ This deterrence effort failed when the Argentine aircraft carrier *25 de Mayo* with twenty planes, four warships, and 5,000 Argentine troops successfully executed Operation AZUL and retook the Falkland Islands on 1 April 1982.²⁰ The next day, the Argentine Atlantic Survey Ship *Bahía Paraíso* landed a party of approximately 100 Argentinean marines at Leith whaling station and successfully invaded South Georgia.²¹ To the junta, both PROJECT ALPHA and Operation AZUL were considered a huge success because no loss of British life occurred. The Argentines thus hoped this would not provoke a military response from the United Kingdom. Nevertheless, the junta then executed a follow-up plan by sending 11,000 Argentinean troops to the Falklands – their effort to deter the British from trying to retake the islands.²²

Under the surface fleet command of Rear Admiral Gualter Allara, the CANA had the following naval assets to defend the seas and the troops on the Falklands: one small aircraft carrier, the *25 de Mayo*; an old American WWII light cruiser (formerly known as the USS Phoenix), *General Belgrano*; two functional submarines, *Santa Fe* and *San Luis*; approximately thirteen other warships;²³ ten carrier based A4Q Skyhawks, five Super Etendards with an equal number of the Exocet missiles; and four marine battalions.²⁴ Since the Super Etendard was the newest addition to the navy and had not been integrated to launch from the *25 de Mayo*, it was land based out of Rio Grande, Argentina's mainland.²⁵

The FAA had a fleet of 180 combat aircrafts: eleven Mirage 3s, thirty-four Daggers, forty-six A4B and A4C Skyhawks, six Mk.62 Canberra bombers, twenty-five IA-58 Pucarás, two KC-130 tankers, and other non-combat aircraft scattered throughout coastal bases on the Argentine mainland.²⁶ Although the Canberras, Skyhawks, and Pucarás were considered obsolescent aircraft due to their outdated airframes, aged engines, slower speed, and lesser maneuverable than the British Harriers, the supersonic Mirage 3s and Daggers were competent fighters. Consequently, the 400-miles of separation from the mainland and supported by only two air refueling tankers had a profound negative performance impact on the Argentine's aircrafts. For example, a Mirage 3 carrying three 1,500 liter drop tanks of fuel and two Matra missiles has only 12 to 15 minutes of time on station over the East Falkland.²⁷ Furthermore, Argentine FAA's real problem was their air-to-air missile, which was decidedly inferior to the AIM-9L Sidewinder possessed by the British.²⁸ The French made Matra R550 Magic 1 air-to-air missile possessed by the FAA is limited to tail aspect engagements due to the seeker design; therefore, it was no match against the Sidewinder that has an infrared seeker with an all-aspect engagement capability and a fragmentation warhead on an active laser fuse.²⁹

Specification of AIM-9L Sidewinder vs. Matra R550 Magic 1

	AIM-9L Sidewinder	Matra R550 Magic 1
Length:	2.87 m	2.72 m
Body diameter:	127 mm	157 mm
Wing Span:	0.64 m	0.66 m
Launch weight:	87 kg	89 kg
Warhead:	9.5 kg fragmentation	13 kg fragmentation
Fuse:	Active laser	IR
Guidance:	IR	IR
Propulsion:	Solid propellant	Solid propellant
Engagement Envelope:	All aspect	Tail aspect only
Range:	8 km	3 km

Despite the junta's hope, the British responded to the incursion of South Georgia and the Falklands with Operation CORPORATE, the name given to move a Task Force to the area of the Falklands, and their reconquest and subsequent return to United Kingdom sovereignty.³⁰

Commanded by Admiral Sir John Fieldhouse, the Joint Task Force commander of the British forces, from Northwood, England, Operation CORPORATE was mounted quickly and at a very short notice.³¹ Notably, Rear Admiral J. F. Woodward, commander of the on-scene RN surface fleet, commanded the following RN's assets toward South Atlantic: two small aircraft carriers, the *Invincible* and the *Hermes*, five nuclear submarines, approximately one hundred mixture of warships and supply ships, and ten Harriers and twenty-eight Sea Harriers.³²

In an effort to compensate for the 7,500 miles logistical nightmarish gap between the United Kingdom and the Falkland Islands, the British forces received authority from the United States to utilize the American made *Wideawake* airfield, a 10,000 foot-long runway, on Ascension Island – an island under United Kingdom sovereignty, located 3,500 miles North-East of the Falklands, and 4,000 miles Southwest of the United Kingdom.³³ Still too great of a distance for any meaningful support, yet nevertheless the Ascension Island took on the role as a forward operating base and logistical hub throughout the war.³⁴ Furthermore, the United States opted to assist its core ally in the Cold War, subsidized Britain with critical equipment, satellite

communication and reconnaissance, as well as 12.5 million gallons of jet fuel that made Operation CORPORATE a logistical reality.³⁵ On 30 April 1982, the United States publicly committed full support for the United Kingdom in the Falklands War.

Opening for War by Retaking South Georgia

On the basis of fighting experience, training, and deployment of advanced weaponry and systems, the British military in comparison with their Argentine opponents, was wholly superior. However, the distance of the Falkland Islands from the United Kingdom and the Ascension Island greatly reduced British air capability. Even with hundreds of years in naval combat experience, the political atmosphere in Britain had induced a decline in RN personnel and ships, and more was planned in the future; therefore, at the onset of the war, neither country appeared to have a distinct advantage over the other. Nonetheless, on 28 April 1982, the United Kingdom declared a 200 mile total exclusion zone around the Falklands as a means to halt all shipping and flights near them, specifically the Argentine's logistical support to the islands. With conflict looming between Argentina and the United Kingdom imminent, and for each country their sophisticated weapons and platforms were ready for deployment.

On 25 April 1982, a British Wessex helicopter from *Plymouth*, a frigate, spotted the *Santa Fe* on the surface near South Georgia.³⁶ Quick antisubmarine action by the Wessex, armed with depth-charges, and a Lynx helicopter, armed with torpedo from the frigate *Brilliant*, quickly persuaded the captain of *Santa Fe* to abandon his ship near the shores of Grytviken after sustaining damages from the attacks.³⁷ Later in the day at approximately 14.15 Zulu, the British landed seventy-four men on South Georgia, and *Antrim*, a destroyer, and *Plymouth* began shelling the area around Grytviken as a show of force. Approximately three hours later, the

Argentineans signaled surrender after *Antrim* steamed into the bay and threatened to fire directly at the Argentineans.³⁸ The retaking of South Georgia resulted in no loss of life.

Harrier versus the Mirage

On 1 May 1982, three separate air engagements between Harriers and Mirage 3s occurred. In the first one, two Harriers attempted to engage two Mirage 3s at different altitudes. For several minutes the two forces maneuvered defensively at different altitudes and outside the other aircraft's killing zone. In the process, the Harrier pilots were unwilling to climb and lose maneuverability while the Mirage pilots were unwilling to descend and lose speed.³⁹ Given the above-mentioned time on station issue, the Mirages were likely low on fuel, disengaged from the fight, and retreated back to the Argentine mainland.⁴⁰ In the second engagement, two high-flying Mirage 3s screamed down toward two Harriers at lower altitude and fired their missiles. The Mirages did not stay to fight; they had expended their missiles and were short on fuel. More importantly, their missiles were inferior to those used by the British and the Harriers were not hit."⁴¹ In the third encounter, two Mirage 3s were shot down by two Harriers using the Sidewinder. During the engagement, the Mirage 3s launched two air-to-air missiles (Matra) at the Harriers. The first missile flew aimlessly by them without hitting the Harriers and the other missile simply fell off the Mirage 3.⁴² This showed that the Argentine air-to-air missile was wholly inferior to the Sidewinder and/or compounded by the inexperienced Argentine pilots; the result: the Harrier pilots were able to use their superior Sidewinder missiles to shoot down the Mirage 3s.⁴³

Aside from the earlier engagements with the Mirage 3s, two other Harriers came under attack from an unspecified number of Daggers on the same day. This time, a Dagger with a missile lock fired its missile at one of the Harriers. Even when the first Harrier pilot dived away

steeply in an effort to avoid the missile, it followed the Harrier for some distance before expanded its fuel and falling into the sea.⁴⁴ Meanwhile, the second Harrier pilot easily downed his opposing Dagger with his Sidewinder. A few minutes later, a separate pair of Harriers spotted three Canberra bombers en route toward the British fleet. After destroying one with a Sidewinder, the other two Canberras immediately retreated back toward the Argentine mainland.⁴⁵

At the end of the day, two Mirages 3s, one Dagger, and one Canberra were shot down by the Harrier using the Sidewinder. These engagements also demonstrated that the Argentine pilots knew how and when not to engage the Harriers by the virtue of their first and second engagement. Furthermore, the May 1st engagements showed two tactical deficiencies of the Argentine jets: (1) the Argentine air-to-air Matra missile was inferior to the Sidewinder, and (2) that all of the Argentine land based aircraft suffered from an 800 mile penalty to and from the Falklands that which greatly reduced their loitering time and time on station.⁴⁶ As Martin Middlebrook summarized, “the British [air] superiority was achieved through having better missiles – the Sidewinder AIM-9L was superior to the Matra missiles being used by the Argentinian [sic] – better ‘software’ systems in their aircraft computers, and much better pilot training.”⁴⁷

Unbeknownst to the Harrier pilots, their successes against the Mirages were multiplied by the first “Black Buck” bombing raid. Executed on the premise that the FAA had extended the Port Stanley airfield to accommodate modern fighter and bombers that could threaten the entire British fleet, therefore a single Vulcan bomber from Ascension Island carrying seven one thousand pound bombs attempted to render it unusable.⁴⁸ Bombing before the dawn on 1 May 1982, one of the seven bombs dropped by the Vulcan bomber hit the center of the runway.⁴⁹ As a

result of the “Black Buck” mission, and possibly the unimpressive performance of the first day’s encounter with the Harrier and its Sidewinder, the FAA decided to reserve the Mirage 3s for defense of mainland from the Vulcan bombers that never came. For the remainder of the war, the Mirage 3 sat on Argentine mainland bases and never again given the opportunity to refine their ability to engage the Harrier.⁵⁰ The Dagger was constrained as well; instead of using it as a fighter, the aircraft was deployed as a bomber.⁵¹ From this point forward, none of the Argentine fighter jets over the Falklands were armed with air-to-air missiles.⁵² The FAA had radically decided to forgo any possibility of an air-to-air victory, and armed their jets only with bombs in an all out attack on the British fleet. Although the decision by the FAA to not challenge the British for air superiority seemed logistically sound, this decision would have serious implications and dire effects with regards to protecting the Falklands when the British’s expeditionary force achieved both air and sea superiority. Based on the aforementioned facts, the Sidewinder and the Harrier, weapon and platform respectively, were responsible for how the FAA deployed their fleet of fighter jets during the rest of the campaign. This conclusion is contrary to Christopher Chant’s *Air War in the Falklands 1982* in which he believed that the first “Back Buck” mission was solely responsible for the FAA’s decision to shelve the Mirage 3s.⁵³

British Nuclear Submarines Shaping the Argentinean Fleet

The availability of nuclear submarines gave the British the means and the will to enforce the 200-mile total exclusion zone for the purpose of protecting their fleet and isolating by sea the Falklands. However, while it was understood that any Argentinean ship or plane inside the 200-mile zone would be attacked, much ignored by the world’s press was that the British had also advised the Argentineans that any ship or plane outside the zone might be attacked without further warning if it was considered to be a threat to the British forces.⁵⁴ On 1 May 1982, the

Conqueror, a British nuclear-powered submarine, found the *General Belgrano* accompanied by two destroyers just outside the total exclusion zone zigzagging at first and then rendezvous with a tanker. This event indicated that the old ship was to partake on a long mission.⁵⁵ Fearing the old ship's mixture of six and five inch guns (which could outgun any of the British ships), and her destroyer escorts outfitted with Exocet missiles, which had a range of more than twenty miles, the *Belgrano* could change course and steam towards the British fleet overnight and might lose the *Conqueror* in the darkness over the shallow Burdwood Bank. "As day light passed, Woodward was concerned that he was in increasing danger and he asked for the *Conqueror* to be given permission to attack the *Belgrano*."⁵⁶ On 2 May 1982, after having received permission to fire from Thatcher's War Cabinet, Commander Christopher Wreford-Brown of the *Conqueror* fired three Mark 8 torpedoes at 18.57 Zulu, two of which stuck. At approximately 5 p.m., the Argentine warship sank and taking with her 368 lives.⁵⁷

Although no Argentinean ship is known to have violated the 200-mile total exclusion zone throughout the war, the decision to attack the *Belgrano* outside it reinforced the capabilities of the nuclear powered attack submarines. Ultimately, this action and capability influenced the Argentine navy in its decisions on how to not employ the *25 de Mayo*, Argentine's sole aircraft carrier.⁵⁸ At approximately 9 p.m., four hours after the sinking of the *Belgrano*, the Argentine naval command ordered Admiral Allara to withdraw the entire surface fleet to protected waters. Thus in an apparent move to protect the *25 de Mayo* from British's submarines, the carrier was retired to port for the duration of the conflict, and its Skyhawks were sent south to operate from the airfield at Naval Air Station Río Grande.⁵⁹ The threat of the RN's nuclear submarines thus effected a command decision – limiting the naval aspects of the war in many ways.

Five Air-Launched and One Land-Based Exocet Missiles

Capable of shaping a war by its own right, the Exocet missile was Argentina's potential neutralizer to the British fleet and its amphibious threat. Dubbed as a "decisive weapon," the Exocet proved its worth on the morning of 4 May 1982 after an Argentinean Neptune reconnaissance plane spotted a small British flotilla 100 miles south of Port Stanley.⁶⁰ Afterwards, two Super Etendards were launched from Rio Grande, the closest Argentine mainland base to the Falklands, and the largest targeted ship's location data was electronically fed into the Exocet missile's guidance system.⁶¹ The Super Etendards took on fuel from a KC-130 and resumed an attack altitude of fifty feet above water toward the unsuspecting HMS *Sheffield*, a Type 42 destroyer.⁶² The two Exocet missiles were reportedly launched from a range of six miles from the target: one Exocet struck the *Sheffield* while the other one failed to lock on to a target and splashed into the sea.⁶³ The missile that struck *Sheffield* created a ten by four feet gash, engulfed the destroyer in flames, and killed twenty sailors onboard.⁶⁴ Six days later, *Sheffield* sank from the damage incurred.⁶⁵

"The event [as described above] had a major effect on the tactical thinking of Admiral Woodward and his senior commanders, who decided that subsequent naval operations would have to be conducted in a manner that would reduce, as far as possible, the likelihood of other ships of the task force falling victim to this highly capable weapon."⁶⁶ Fieldhouse later advised that the Exocet presented a particularly dangerous and difficult threat, and "the loss of the ship [*Sheffield*] 'was an expensive warning and a foretaste of real Argentine capability.'"⁶⁷ This is another example of how a piece of technology, in this case the Exocet, shaped an opponent's tactical decision. Just as the aforementioned nuclear powered submarine and the Sidewinder missiles shaped the Argentine navy's deployments, conversely the fear of additional Exocet strikes changed how the British deployed its fleet.

In response to the Exocet threat, Admiral Woodward ordered his carriers eastwards until they were beyond the range of both Argentines's land based aircraft and their Exocet missiles. This decision and the new position of the carriers also diminished the operational readiness of the Harrier.⁶⁸ On 6 May 1982, Woodward warned the amphibious force that he would not be able to achieve aerial superiority before the landing on the Falklands.⁶⁹ "No longer willing to expose his carriers to the dangers of Exocet attack, Woodward decided to provoke the Argentines into a ship based missile trap by sending his Type 22 frigates and Type 42 destroyers in pairs close to the islands."⁷⁰ The '42-22' strategy, as it became known, was to utilize the Type 42's Sea Dart system to engage the Argentine air threat at medium range, while the Type 22's Sea Wolf system would deal with any air threat at close range.⁷¹ (The success of this missile trap will be discussed later in the Restrained Argentine Fighter Jets section.)

Unbeknownst to the British command, the Neptune reconnaissance plane that initially guided the successful Exocet strike was subsequently grounded due to lack of airworthiness.⁷² Unable to find a replacement, detecting the British fleet became guess work for the Westinghouse radar located at Port Stanley.⁷³ After studying the flight path of the Harriers for some time, the Port Stanley radar determined that the British carriers were likely some 125 miles to the north-east of Port Stanley.⁷⁴ On 25 May 1982, twenty-one days after the initial success against the *Sheffield*, two Super Etendards each armed with an Exocet missile, were launched from Rio Grande.⁷⁵ Just as the previous mission, the Super Etendards avoided radar detection by flying at a low altitude toward their targets.⁷⁶ At approximately thirty-five miles range, the pilots gained altitude and released their missiles.⁷⁷ Based on the large radar signature of the target, the Argentine pilots were sure that their Exocet was tracking a British aircraft carrier. Instead, at least one missile locked onto the *Atlantic Conveyor*, a 15,000-ton British container ship.⁷⁸ It is

unclear whether one or both Exocet missiles struck the *Atlantic Conveyor*; regardless, the large ship caught fire and sank five days later.⁷⁹ “The British casualties were twelve men, and material losses included one Lynx, six Wessex, and three Chinook helicopters, virtually all the tents for the ground forces, spare parts and tools for the Harriers, munitions including cluster bombs, and metal planking required for the creation of an advanced airstrip on East Falkland.”⁸⁰ Although barely missing the *Hermes* that was two miles away, the sinking of the *Atlantic Conveyor* was a major blow for the landing force: the loss of the helicopters embarked on her led to major movement problems for the British troops on the inhospitable terrain in the East Falkland.⁸¹ Ultimately, it had only a short term effect on British tactical operations ashore. Nevertheless, due to the professionalism and training of the Royal Marines, their subsequent 50-mile trek across the inhospitable East Falkland without air lift assets became only an inconvenience.

With only one air-launch Exocet missile left, this time the FAA requested that four Skyhawks be permitted to accompany the Super Etendards on their mission to launch the last Exocet.⁸² On 30 May 1982, the plan was to have the Skyhawks, each carrying two 500-pound bombs, to initially follow the two Super Etendards, one was armed with the Exocet while the other was included in the raid so that it could help if the missile-carrying aircraft suffered a radar failure.⁸³ As the last missile was launched, the Skyhawks would follow the missile’s exhaust to target, presumably a British aircraft-carrier, and complete the mission.⁸⁴ In a lackluster performance, the last air launched Exocet missile failed to lock onto a target, expended its fuel, and fell into the sea. Meanwhile, two of the four Skyhawks were shot down, one by *Exeter*, a Type 42 destroyer, and the other by *Avenger*, a Type 21 frigate.⁸⁵

The Super Etendards were thereafter pulled out of action without given the same bombing roles as the Skyhawks. This single-minded decision by the CANA to leave the Super Etendards out of the fight completely, even from bombing British ships, indicated that the CANA did not want to potentially lose their prized air asset to the dominating Harriers.⁸⁶ Similarly fated like the Mirage 3s, the Super Etendards were shelved. However, due to a separate on-going conflict and dispute between Argentina and Chile over the Beagle Channel in Tierra del Fuego (settled in 1984), the shelving of the Mirage 3s and Super Etendards preserved Argentine's military capital that might have to be used at a later time against Argentina's primary potential foe – Chile.⁸⁷

For the five air-launched Exocet missiles in Argentina's possession, each resounded fear and concern on the British fleet, especially on Admiral Woodward.⁸⁸ Not knowing how many Exocet missiles were in CANA's possession, Admiral Woodward "...had to tread the difficult path between keeping his carrier group close enough to the Falklands to conduct operations but far enough away to keep as far out of the range as possible of the Super Etendard from the mainland."⁸⁹ To do so, Admiral Woodward moved his frigates, destroyers, and supply ships closer to the Falklands to form a blocking position so that in the event of an Exocet missile attack these ships became the target rather than the aircraft-carriers.⁹⁰

On 12 June 1982, two days prior to the surrender of the Argentine forces on the Falklands, a land-based Exocet missile slammed into the British Destroyer *Glamorgan* in front of Port Stanley where she had carried out a naval bombardment.⁹¹ "The missile had been removed from the Argentine destroyer *Seguí* and a jury-rigged firing system devised."⁹² The Exocet hit and nearly sank *Glamorgan*, but she survived with the loss of thirteen men.⁹³ With the fight

being so close to the end, the land-based Exocet strike on *Glamorgan* in turn had no impact on Admiral Woodward.

Exocet Missile Matrix

Air-Launched Exocet Missiles	Date Fired	Target	Result
1	5/4/1982	<i>Sheffield</i>	Sank
2	5/4/1982	Missed	--
3	5/25/1982	<i>Atlantic Conveyor</i>	Sank
4	5/25/1982	<i>Atlantic Conveyor?</i>	Sank
5	5/30/1982	Missed	--
Land-Launched Exocet Missile			
1	6/12/1982	<i>Glamorgan</i>	Heavy damage

The Constrained Argentine Fighter Jets

The purpose of the mentioning the FAA's large fleet of fighter jets is to understand how the British Harriers and American made Sidewinders shaped and exploited their deployment. Since the Argentine FAA had approximately 180 fighter and bomber aircrafts, their use of them to compensate for the limited quantity of Exocet missiles were both creative and tactically sound – an alternative to the lack of technological weapon superiority and in quantity. Therefore, this analysis is uniquely qualified to analyze the effectiveness of the FAA's fleet of jets that nearly defeated British's amphibious landings.

The first FAA aerial attack on the British fleet occurred on 12 May 1982 when an unspecified number of A4B Skyhawks carrying 500-pound bombs attacked the destroyers *Glasgow* and *Brilliant* near Port Stanley.⁹⁴ (See Appendix B) Bombs that were fused for high altitude release failed to detonate as one struck and passed through *Glasgow*, effectively putting her out of action without causing massive casualties or sinking the ship.⁹⁵ Although *Glasgow's* damage was not serious, it caused problems that would force her to return to Britain before the end of the war.⁹⁶ This would be the first of many incidents in which bombs dropped by

Argentine pilots failed to detonate after hitting their intended target. The attacks resulted in four Skyhawks shot down, three by *Brilliant* and one mistakenly by the Argentinean anti-air defense at Port Stanley.⁹⁷

The second FAA aerial attack occurred on 21 May 1982 when twenty-six Argentine aircraft, a mixture of Skyhawks and Daggers, attacked the British warships near San Carlos.⁹⁸ The Argentine pilots surprised the British warships by flying in very low and struck the vessels with their 500-pound bombs with an extraordinary degree of accuracy.⁹⁹ At least ten bombs hit their targets, but the low altitude bombardment also meant that the bombs did not have enough time to fuse and detonate.¹⁰⁰ "Of the five warships hit, only *Ardent* was sinking. *Brilliant* and *Broadsword*, a frigate, had been damaged by cannon fire, and *Argonaut*, a frigate, and *Antrim*, a Type 82 destroyer, had been temporarily put out of action with unexploded bombs inside them. Ten Argentine aircraft, five Daggers and five Skyhawks, had been shot down, all but one of them by Harriers."¹⁰¹

On 22 May 1982, the Argentine FAA made another strike which left an unexploded bomb lodged inside the frigate *Antelope*.¹⁰² Later that evening, the bomb exploded while engineers were attempting to defuse it, and *Antelope* would later sink as a result of the blast.¹⁰³ The intensity of the Argentine FAA attacks led Admiral Woodward to deploy the destroyers *Coventry* and *Broadsword* westward near Pebble Island to form an early warning line. Consequently, on 25 May 1982, Argentine observation posts near Pebble Island spotted the ships and vectored in an air attack. *Broadsword* was hit by a bomb, which again did not explode; however, three bombs found their target on *Coventry*, killing nineteen crewmen and sinking her.¹⁰⁴

The last FAA aerial bombardment operation against British ships occurred on 7 June 1982 when an Argentine observation post on Mount Harriet spotted British amphibious shipping movement at Fitzroy and vectored in an airstrike.¹⁰⁵ Five Skyhawks and five Daggers found the *Plymouth* on its way to Fitzroy, and two landing ship logistics ships, *Sir Tristram* and *Sir Galahad* south of Fitzroy.¹⁰⁶ Before the Daggers were chased away by two Harriers on patrol, they had already scored four direct bomb hits on the *Plymouth*, although none of them exploded.¹⁰⁷ The Skyhawks continued on and found the two landing ships logistics. The Skyhawks hit *Sir Tristram* with two bombs, one passing through the ship without detonating while the other exploded killing two crewmen. *Sir Galahad* was less fortunate. Three bombs were dropped at a higher altitude and hit her, killing forty-six Welsh Guards who had not disembarked, and putting her completely out of action.¹⁰⁸ On the previous day, 350 Welsh Guardsmen were reluctant to depart *Sir Galahad* at Fitzroy; instead, they opted to stay on the ship for an extra day rather than making the five-mile march from Fitzroy to Bluff Cove.¹⁰⁹ A subsequent wave of Skyhawks spotted and attacked the landing craft *Foxtrot Four* between Goose Green and Fitzroy, killing six of her crew before being chased away by Harriers.¹¹⁰ In this last FAA ship bombardment, three Skyhawks were shot down by Harriers with AIM-9L Sidewinder missiles.¹¹¹

As the result of the FAA operations to against the British fleet and to compensate for the limited Exocet missiles, five British ships were sunk: *Glasgow*, *Ardent*, *Antelope*, *Coventry*, and *Sir Galahad*. Significantly, seven British ships were hit by bombs but did not sink: *Antrim*, *Argonaut*, *Broadsword*, *Plymouth*, *Sir Tristram*, and *Foxtrot Four*. It is the luck of the English that France did not provide Argentina with the operational knowledge in properly fusing bombs for a low altitude bombardment, or simply, the bombs were dropped from extremely low altitude

that changes made to the fuse would have negligible differences on the outcome. Nevertheless, this bomb fusing issue took away an alternative scenario for the Argentines because the amount of devastation that each of the bombs would have caused if they had exploded. This could have been a game changer. In their attempt to attack British ships, Argentina lost twelve Skyhawks and five Daggers while inflicted some damage on the British fleet; such successes, however, could not ultimately defend the Argentine position in the Falklands.

FAA Bomb Hit Matrix

Date	Ship	Number of Bomb(s)	Result
5/12/1982	<i>Glasgow</i>	1	Out of Action/Sunk
5/21/1982	<i>Ardent</i>	5	Sunk
5/21/1982	<i>Brilliant</i>	Cannon Fire	Light Damage
5/21/1982	<i>Antrim</i>	1	Out of Action
5/21/1982	<i>Broadsword</i>	Cannon Fire	Light Damage
5/22/1982	<i>Antelope</i>	2	Sunk
5/25/1982	<i>Broadsword</i>	1	Damaged
5/25/1982	<i>Coventry</i>	3	Sunk
6/7/1982	<i>Plymouth</i>	4	Damaged
6/7/1982	<i>Sir Tristram</i>	2	Damaged
6/7/1982	<i>Sir Galahad</i>	3	Sunk
6/7/1982	<i>Foxtrot Four</i>	1	Damaged

Conclusion

The analysis of deployment of technological weapons on both sides of the Falklands War has proven that superior weapons can readily shape a commanders' decision and thus the outcome of a war. For the British, the Harriers' Sidewinders effectively negated Argentine's efforts at aerial dominance. In the eventual game of cat and mouse, the Argentine fighter jets were the mouse with inferior missiles and they had no other options but to run when encountering Harrier the cat. The sinking of the *Belgrano* was equally effective in influencing the Argentine navy's employment (or lack thereof) of the *25 de Mayo*. After the *Belgrano* was sunk, the Argentine fleet was ordered to port. Without the Argentine surface fleet at sea or additional Exocet missiles, the British had only the constrained FAA bomb laden fighter jets to

contend the skies over the Falklands and the seas around them. Once Argentina lost sea and air control over the Falklands, the Argentine land forces became isolated. Thus, the British forces in essence had effectively paved their way to victory by shaping the battlefield with their superior weapon systems and effective use of them.

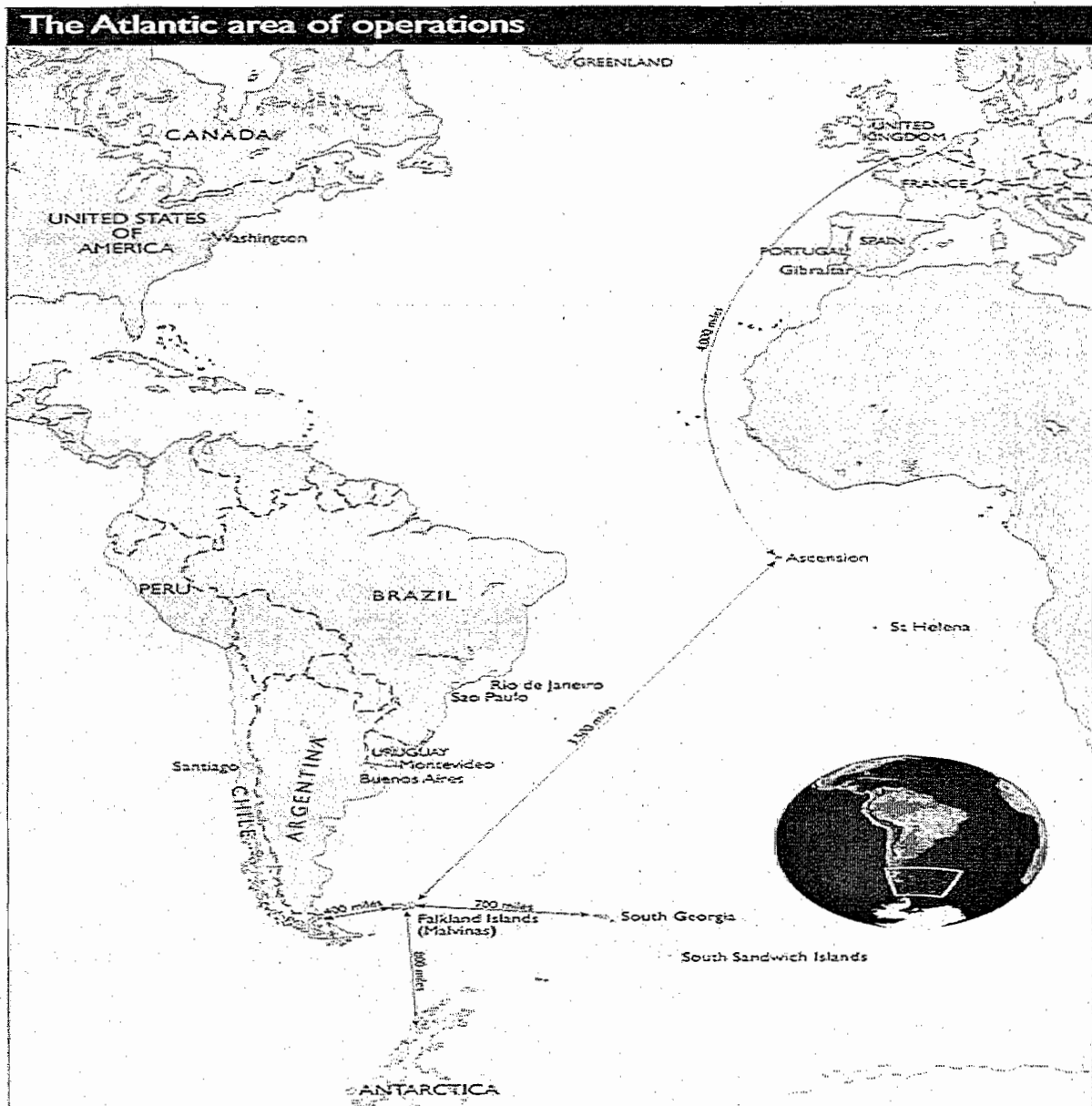
In terms of Argentina's technological weapon deployment, the limited quantity of air-launched Exocet missiles tactically affected Admiral Woodward's decision to move the aircraft carriers further eastward outside the range of the land based aircraft and the Exocet. With the aircraft-carriers further out, this decreased the Harrier's time on station while also possibly reducing the number of the Argentinean jets that would have fallen prey to the Harriers' Sidewinders. If Argentina had had more air-launched Exocet missiles, it could have potentially devastated Admiral Woodward's '42-22' strategy, thereby bringing any attempts to conduct operational maneuver from the sea to a halt.

Lastly, the creative strategy to compensate for the limited quantity Exocet missiles was unexpectedly met with operational knowledge failure. Argentine pilots that evaded the Harriers, survived the '42-22' defensive missiles, and successfully dropped their bombs onto a British warship were disappointed in that many of their bombs which hit the targets failed to detonate. In the end, Argentina's attempt to compensate for the Exocet was just not enough despite the valor and skill of their pilots. British resolve could not be broken when Skyhawks and Daggers were being shot down at an alarming number. Similarly, like the nuclear powered submarines, the Exocet had the potential stage presence to decisively shape the enemy's decision whereas the Argentine bombers did not – further evidence that there is no substitution for technological superiority in quality and quantity. In the end, Argentina's technological weapon deployment had little effect on shaping the British's strategic and operational level of war. As the result,

Argentina's bid for retaining their possession of the Malvinas in the Falklands War was shortchanged by these factors.

APPENDIX

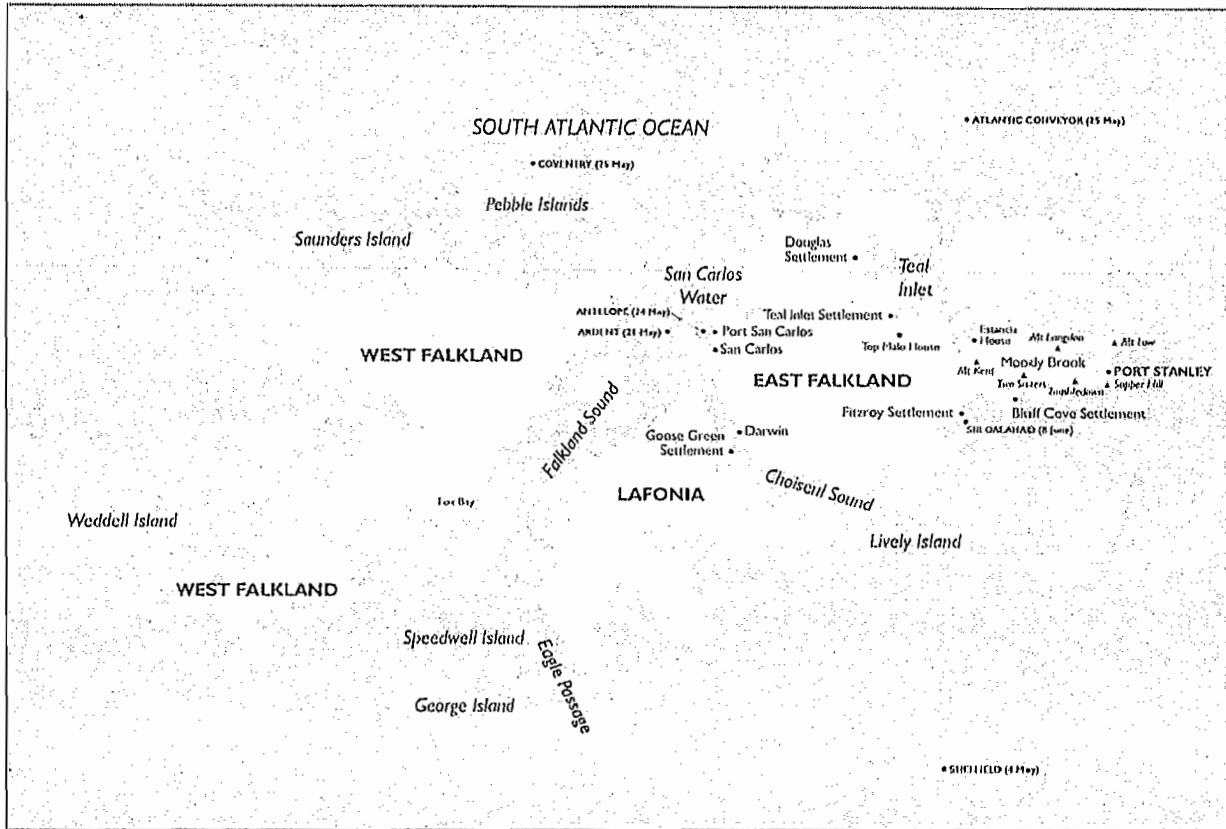
A



Graphic taken from Duncan Anderson, *Essential Histories: The Falklands War 1982* (2002), 14.

APPENDIX B

Map of the Falkland Islands



Graphic taken from Christopher Chant, *Air Combat Aircraft #28: Air War in the Falklands, 1982* (2001), 6.

APPENDIX C

Chronology of Events

Date	Military Action
15 March	Vice Admiral Lombardo presented the first version of the military plan
26 March	At least one British nuclear submarine was ordered to the Falklands
1 April	Argentine invasion of Falklands
2 April	Argentine Captures South Georgia
25 April	United Kingdom recaptures South Georgia
28 April	United Kingdom enforces the 200-mile total exclusion zone
30 April	United States commits full support for the United Kingdom
1 May	First aerial engagement between Harriers and Mirage 3s The first of seven - only successful Black Buck mission
2 May	<i>Conqueror</i> sinks the <i>Belgrano</i>
4 May	<i>Sheffield</i> is sunk by an Exocet
12 May	First FAA aerial bombing of British fleet
21 May	Second FAA aerial bombing of British fleet
25 May	<i>Atlantic Conveyor</i> is sunk by Exocets
12 June	<i>Glamorgan</i> is struck by a land-launched Exocet
14 June	Argentine surrender

APPENDIX D

Principal Combat Aircraft engaged in the South Atlantic

HARRIER GR3

Speed: maximum at low altitude, 640 knots/1,185kph/736mph

Payload: maximum external weapon load, 5,000lb/2,270kg

Range: with one in-flight refuelling, over 3,000 nautical miles/5,560km/3,455 statute miles



HARRIER GR3

SEA HARRIER

Speed: maximum level speed, as GR3

Payload: maximum weapon load, 8,000lb/3,630kg

Range (varies according to mission performed): high altitude intercept radius with 3 minutes combat and reserves for vertical landing, 400 nautical miles/750km/460 statute miles; strike radius, 250 nautical miles/463km/288 statute miles



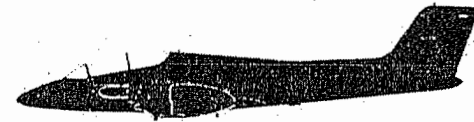
SEA HARRIER

PUCARA

Speed: maximum level speed at 3,000m or 9,845 feet altitude, 270 knots/500kph/310mph

Payload: total external stores, 1,620kg/3,571lb

Range: with maximum fuel at 5,000m or 16,400 feet altitude, 1,641 nautical miles/3,042km/1,890 statute miles



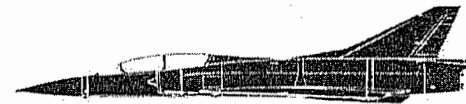
PUCARA

MIRAGE III-E

Speed: maximum level speed at sea level, 750 knots/1,390kph/863mph

Payload: approx 3,000lb

Range: combat radius, ground attack, 647 nautical miles/1,200km/745 statute miles



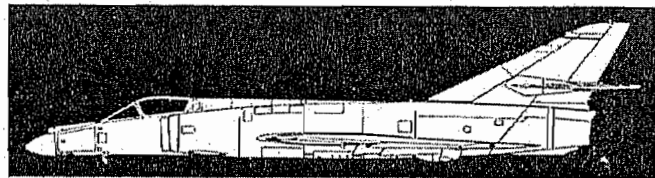
MIRAGE III

SUPER ETENDARD

Speed: maximum level speed at low altitude, 650 knots/1,204kph/748mph

Payload: maximum weapon load, internal fuel only, 4,630lb/2,100kg

range: radius of action, with AM.39 Exocet, 350 nautical miles/650km/403 statute miles



SUPER ETENDARD

Max Hastings and Simon Jenkins, *The Battle for the Falklands*, (1983), 354.

Annotated Bibliography

Books

Anderson, Duncan. *The Falklands War 1982, Essential Histories*. Oxford, United Kingdom, Osprey 2002. This book is excellent and is one of the backbones for my research. The author was clear on the chronology of events and described them very well.

Bijl, Nicholas. *Men at Arms Series: Argentine Forces in the Falklands*. New York, New York, Osprey Publishing, 1999. This book was mostly about land based campaign and was of limited value considering the focus of this paper.

Badsey, Stephen, Havers, Rob, and Grove, Mark. *The Falklands Conflict Twenty Years On, Lessons for the Future*. New York, Frank Cass, 2005. As reflected in the title, this book brought an overview of the war and lessons learned for today's military rather than what I needed for this paper. However, I found the discussion on the short range missile versus today's medium range missile interesting.

Braybrook, Roy. *Man-At-Arms Series 135: Battle for the Falklands (3) Air Forces*. London, United Kingdom, Osprey, 1982. This book's information is good for quick reference. Chris Chant's book is better.

Burden, Rodney, Richael Draper, Douglas Rough, Colin Smith, and David Wilton. *Falklands the Air War*. London, United Kingdom, Arms and Armour Press, 1986. This book is excellent regarding aircraft used during the Falklands War. However, it was a stale read.

Chant, Christopher. *Osprey Combat Aircraft #28: Air War in the Falklands 1982*. Oxford, United Kingdom, Osprey, 2001. This book is outstanding when describing aerial combat over the Falklands. The narration was excellent that formulated much of the narration as part of my thesis.

Freedman, Sir Lawrence. *The Official History of the Falklands Campaign, Volume 1: The Origins of the Falklands War*. Oxon, United Kingdom, Routledge, 2005. This book is a good reference for the political background of the Falklands.

Freedman, Sir Lawrence. *The Official History of the Falklands Campaign, Volume 2: War and Diplomacy*. Oxon, United Kingdom, Routledge, 2005. This book is the encyclopedia of the Falklands War, a must read.

Gunston, Bill. "Harrier." In *The Great Book of Modern Warplanes*, edited by Bill Sweetman, Michael J. Gething, Doug Richardson, and Mike Spick, 370-375. New York, New York, Portland House, 1987. This is an excellent succinct summary on Operation Corporate with many original pictures not found elsewhere.

Hastings, Max, and Jenkins, Simon. *The Battle for the Falklands*. New York, New York, W. W. Norton, 1983. This book is the closest competitor with the Martin Middlebrook's (listed below). As such, is one of the best on the subject of the Falklands War.

Middlebrook, Martin. *Task Force: The Falklands War, 1982*. Revised Edition, New York, Viking Penguin Books, 1987. This author is one of the best resources on the Falklands War.

Scheina, Robert L. *Latin America's Wars, The Age of the Professional Soldier, 1900-2001 Volume 2*, [Ch 33, The Malvinas (Falkland) Islands], Washington DC, Brassey's, Inc., 2003. This book is a fine resource if seeking a to-the-marrow fact on the Falklands War. I used this book as a frame work for my research and Middlebrook's for core facts.

Smith, Gordon. *Battle Atlas of the Falklands War 1982: By Land, Sea and Air*. Penarth, United Kingdom, Naval-History.Net 2006. The layout of the book is confusing and the information was difficult to find. Although it contains many graphics, all are black-and-white with the maps in unappealing low resolution.

Reports

Weiss, Kenneth G. "The War for the Falklands: A Chronology." Professional Paper 420 Center for Naval Analyses, August 1982. Appropriate for timeline.

Wheen, David G. "The Falklands War 1982: A Rifle Company Commander's Respective." United States Marine Corps University, Command and Staff College, Quantico, VA, March, 25, 1986. This research paper was an interesting read but did not help.

DVD

The History Channel. The Falklands Campaign DVD. www.history.com. Fine for a limited and visual overview of the conflict.

Online Databases

Jane's Information Group, "Jane's Aircraft Upgrades: Dassault Mirage III," posted on 05/28/2009, <http://www.janes.com/>. Provided the specification on Mirage III.

Jane's Information Group, "Jane's Air-Launched Weapons: AIM-9 Sidewinder Legacy Variants (AIM-9B to AIM-9S)," posted on 07/16/2009, <http://www.janes.com/>. Provided the specification on the Sidewinder missile.

ENDNOTES

- ¹ Bill Gunston, "Harriers," In *Great Book of Modern Warplanes*, edited by Bill Sweetman, Michael J. Gething, and Mike Spick (New York, NY: Portland House, 1987), 370 and 392.
- ² Christopher Chant, *Osprey Combat Aircraft #28: Air War in the Falklands 1982* (Oxford, UK: Osprey Publishing, 2001), 46.
- ³ Martin Middlebrook, *Task Force: The Falklands War, 1982* (Revised Edition, New York: Viking Penguin Books, 1987), 137.
- ⁴ Chant, *Osprey Combat Aircraft #28*, 46.
- ⁵ Gordon Smith, *Battle Atlas of the Falklands War 1982: By Land, Sea and Air* (Penarth, UK: Naval-History.Net, 2006), 61.
- ⁶ Max Hastings and Simon Jenkins, *The Battle for the Falklands* (New York: W.W. Norton & Company, Inc., 1984), 153.
- ⁷ Duncan Anderson, *Essential Histories: The Falklands War 1982* (Oxford, UK: Osprey Publishing, 2002), 51.
- ⁸ Chant, *Osprey Combat Aircraft #28*, 11.
- ⁹ Robert L. Scheina, *Latin America's Wars. The Age of the Professional Soldier, 1900-2001, II, [Ch 33, The Malvinas (Falklands Islands)]* (Washington DC, Brassey's, Inc., 2003), 308.
- ¹⁰ Scheina, *Latin America's Wars*, 309.
- ¹¹ Anderson, *Essential Histories*, 12.
- ¹² Anderson, *Essential Histories*, 15.
- ¹³ Scheina, *Latin America's Wars*, 309.
- ¹⁴ Middlebrook, *Task Force*, 36-37.
- ¹⁵ Scheina, *Latin America's Wars*, 308.
- ¹⁶ Scheina, *Latin America's Wars*, 308.
- ¹⁷ Scheina, *Latin America's Wars*, 308.
- ¹⁸ Middlebrook, *Task Force*, 39-40.

- ¹⁹ Kenneth G. Weiss, "The War for the Falklands: A Chronology." Professional Paper 420, (Center for Naval Analyses, August 1982), 2.
- ²⁰ Scheina, *Latin America's Wars*, 309.
- ²¹ Middlebrook, *Task Force*, 58.
- ²² Anderson, *Essential Histories*, 30-31.
- ²³ Smith, *Battle Atlas of the Falklands War 1982: By Land, Sea and Air*, 22.
- ²⁴ Scheina, *Latin America's Wars*, 309.
- ²⁵ Anderson, *Essential Histories*, 31.
- ²⁶ Scheina, *Latin America's War*, 309.
- ²⁷ Rodney Burden and others, *Falklands the Air War* (London, UK, Arms and Armour 1986), 144.
- ²⁸ Scheina, *Latin America's Wars*, 309.
- ²⁹ Janes Information Group, "Jane's Air-Launched Weapons: AIM-9 Sidewinder Legacy Variants (AIM-9B to AIM-9S)," posted on 07/16/2009, <http://www.janes.com/>.
- ³⁰ Middlebrook, *Task Force*, 68.
- ³¹ Gunston, "Harriers," 370.
- ³² Gunston, "Harriers," 372. Major General Jeremy Moore was in charge of the Land Forces and Commodore Michael Clapp was in charge of the Amphibious Task Group - both were co-equal on the scene status with Admiral Woodward. Brigadier General Julian Thompson was in charge of the Commando Brigade underneath Major General Moore.
- ³³ Middlebrook, *Task Force*, 90.
- ³⁴ Middlebrook, *Task Force*, 90.
- ³⁵ Scheina, *Latin America's Wars*, 309.
- ³⁶ Middlebrook, *Task Force*, 109.
- ³⁷ Middlebrook, *Task Force*, 109-110.
- ³⁸ Middlebrook, *Task Force*, 112.

- ³⁹ Middlebrook, *Task Force*, 133.
- ⁴⁰ Chant, *Osprey Combat Aircraft #28*, 44.
- ⁴¹ Middlebrook, *Task Force*, 134.
- ⁴² Chant, *Osprey Combat Aircraft #28*, 45.
- ⁴³ Chant, *Osprey Combat Aircraft #28*, 45.
- ⁴⁴ Chant, *Osprey Combat Aircraft #28*, 48.
- ⁴⁵ Chant, *Osprey Combat Aircraft #28*, 48.
- ⁴⁶ Stephen Badsey, Rob Havers, and Mark Grove, *The Falklands Conflict Twenty Years On, Lessons for the Future* (New York: Frank Cass, 2005) , 265-266.
- ⁴⁷ Middlebrook, *Task Force*, 137.
- ⁴⁸ Anderson, *Essential Histories*, 37.
- ⁴⁹ Anderson, *Essential Histories*, 37.
- ⁵⁰ Chant, *Osprey Combat Aircraft #28*, 49.
- ⁵¹ Chant, *Osprey Combat Aircraft #28*, 49.
- ⁵² Chant, *Osprey Combat Aircraft #28*, 49.
- ⁵³ Chant, *Osprey Combat Aircraft #28*, 49.
- ⁵⁴ Middlebrook, *Task Force*, 143.
- ⁵⁵ Middlebrook, *Task Force*, 148.
- ⁵⁶ Middlebrook, *Task Force*, 147.
- ⁵⁷ Middlebrook, *Task Force*, 150.
- ⁵⁸ Middlebrook, *Task Force*, 45-47.
- ⁵⁹ Scheina, *Latin America's Wars*, 313.
- ⁶⁰ Chant, *Osprey Combat Aircraft #28*, 53.

- ⁶¹ Middlebrook, *Task Force*, 156.
- ⁶² Scheina, *Latin America's Wars*, 314.
- ⁶³ Middlebrook, *Task Force*, 159.
- ⁶⁴ Scheina, *Latin America's Wars*, 314.
- ⁶⁵ Hastings and Jenkins, *The Battle for the Falklands*, 155.
- ⁶⁶ Chant, *Osprey Combat Aircraft #28*, 51.
- ⁶⁷ Sir Lawrence Freedman, *The Official History of the Falklands Campaign, Volume 2: War and Diplomacy*, (Oxon, United Kingdom, Routledge, 2005) 300.
- ⁶⁸ Anderson, *Essential Histories*, 42.
- ⁶⁹ Anderson, *Essential Histories*, 42.
- ⁷⁰ Anderson, *Essential Histories*, 42.
- ⁷¹ Anderson, *Essential Histories*, 42-43.
- ⁷² Scheina, *Latin America's Wars*, 315.
- ⁷³ Scheina, *Latin America's Wars*, 315.
- ⁷⁴ Scheina, *Latin America's Wars*, 315.
- ⁷⁵ Scheina, *Latin America's Wars*, 315.
- ⁷⁶ Chant, *Osprey Combat Aircraft #28*, 55.
- ⁷⁷ Chant, *Osprey Combat Aircraft #28*, 55.
- ⁷⁸ Middlebrook, *Task Force*, 243.
- ⁷⁹ Middlebrook, *Task Force*, 244 and 246.
- ⁸⁰ Chant, *Osprey Combat Aircraft #28*, 55.
- ⁸¹ Chant, *Osprey Combat Aircraft #28*, 55.
- ⁸² Middlebrook, *Task Force*, 287.
- ⁸³ Middlebrook, *Task Force*, 287.

- ⁸⁴ Middlebrook, *Task Force*, 288.
- ⁸⁵ Middlebrook, *Task Force*, 289.
- ⁸⁶ Chant, *Osprey Combat Aircraft #28*, 56.
- ⁸⁷ Scheina, *Latin America's Wars*, 315.
- ⁸⁸ Middlebrook, *Task Force*, 155.
- ⁸⁹ Middlebrook, *Task Force*, 155.
- ⁹⁰ Middlebrook, *Task Force*, 156.
- ⁹¹ Scheina, *Latin America's Wars*, 316.
- ⁹² Scheina, *Latin America's Wars*, 316.
- ⁹³ Hastings and Jenkins, *The Battle for the Falklands*, 279.
- ⁹⁴ Middlebrook, *Task Force*, 189.
- ⁹⁵ Middlebrook, *Task Force*, 190.
- ⁹⁶ Middlebrook, *Task Force*, 190.
- ⁹⁷ Chant, *Osprey Combat Aircraft #28*, 59.
- ⁹⁸ Anderson, *Essential Histories*, 46.
- ⁹⁹ Anderson, *Essential Histories*, 46.
- ¹⁰⁰ Anderson, *Essential Histories*, 46.
- ¹⁰¹ Anderson, *Essential Histories*, 46.
- ¹⁰² Middlebrook, *Task Force*, 232.
- ¹⁰³ Middlebrook, *Task Force*, 232-235.
- ¹⁰⁴ Middlebrook, *Task Force*, 240.
- ¹⁰⁵ Anderson, *Essential Histories*, 59.
- ¹⁰⁶ Anderson, *Essential Histories*, 59.

¹⁰⁷ Anderson, *Essential Histories*, 59.

¹⁰⁸ Middlebrook, *Task Force*, 303-308.

¹⁰⁹ Middlebrook, *Task Force*, 303.

¹¹⁰ Middlebrook, *Task Force*, 311.

¹¹¹ Anderson, *Essential Histories*, 60.